A1 cont'd

means for obtaining a beam transport efficiency between the measurement positions from the beam electric currents measured at respective measurement positions to estimate a ratio of energy contamination specified by a neutralized ion beam and a desired ion beam both of which are implanted in the wafer, by using a correlation between the energy contamination and the beam transport efficiency.

2. (Once Amended) The ion implantation apparatus as claimed in claim 1, the apparatus having an intermediate convergent point or a mass analysis slit for converging the beam within the predetermined path, wherein one of the measurement positions is determined at a front or rear position of the intermediate convergent point or the mass analysis slit, the apparatus being adjusted at one of the measurement positions so that a ratio of the energy contamination is not higher than a predetermined value.

3. (Once Amended) The ion implantation apparatus as claimed in claim 2, wherein the correlation is computed on the basis of a table which stores measurement data of a special correlation that is featured by an inverse proportion relation between the ratio of the energy contamination in the wafer and the beam transport efficiency.

Sub B1

4. (Once Amended) The ion implantation apparatus as claimed in claim 3, wherein the correlation is specified by an inverse proportion relation between the energy contamination and the beam transport efficiency.

5. (Once Amended) The ion implantation apparatus as claimed in claim 1, the apparatus comprising an ion source, an analyzer, an ion deceleration electrode, and a wafer processing chamber, wherein measurement positions are determined at a rear

portion of the ion deceleration electrode and an ion implantation position of the wafer processing chamber; wherein

a' cont'd

a beam transport efficiency being calculated from results measured at respective measurement positions.

Sub B2

6. (Once Amended) The ion implantation apparatus claimed in claim 5, wherein the ratio of the energy contamination is determined in consideration of a deceleration ratio which is defined by the ratio of implanted ion energy to the extracted ion energy.

7. (Once Amended) The ion implantation method for use in an ion implantation apparatus comprising an ion source, an extraction electrode, a mass analysis unit, a mass analysis slit, and a wafer processing chamber, comprising the steps of:

deciding a target value of energy contamination in a wafer;

measuring, along a predetermined path, beam electric currents at a plurality of measurement positions different from each other to obtain a beam transport efficiency of an ion beam; and

adjusting transport efficiency and the energy contamination.

8. (Once Amended) The ion implantation method as claimed in claim 7, further comprising the steps of:

obtaining the beam transport efficiency of the ion beam; and

judging whether or not ion implantation is to be started by comparing the measured beam transport efficiency with a lower limit.

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a1 cont'd
Sub B3

9. (Once Amended) A method of implanting ions into a wafer, comprising the steps of:

setting a beam transport efficiency to a predetermined value to decrease a neutral fraction of the beam; and

monitoring the beam transport efficiency to reduce an energy contamination to a value lower than a target value.

10. (Once Amended) An ion implantation apparatus comprising an ion source, an extraction electrode, a mass analysis unit, a mass analysis slit, and a wafer processing chamber, the apparatus having a measurement point determined at an intermediate convergent point or at a front or rear position of the mass analysis slit and being controlled so that a neutral fraction of a beam becomes lower than a predetermined rate.

11. (Once Amended) The ion implantation apparatus as claimed in claim 10, comprising a first Faraday cup that is located at a first position determined at a front or a rear position of either of intermediate convergent point and the mass analysis slit; a second Faraday cup that is located at a second position determined at a front or rear position of a wafer;

means for measuring beam electric currents at the first and second positions to calculate a difference between the beam electric currents measured at the first and the second positions and to obtain a beam transport efficiency with reference to the difference.

C1 Cont'd

12. (Once Amended) The ion implantation apparatus as claimed in claim 10, wherein a deceleration unit is provided with a beam path of an ion beam, and an amount of ion implantation is controlled and adjusted on the basis of a relation between a beam transport efficiency obtained by the use of the deceleration unit and an energy contamination.

13. (Once Amended) The ion implantation apparatus as claimed in claim 12, wherein the deceleration unit is composed of a deceleration electrode section;

the apparatus being controlled so that the energy contamination does not exceed an allowable amount on the basis of an inverse proportion relation between a beam transport efficiency from the deceleration electrode section to a wafer and the amount of the energy contamination.

14. (Once Amended) The ion implantation apparatus as claimed in claim 13, comprising a first Faraday cup located just after the deceleration electrode section and a second Faraday cup located just after the wafer;

the beam transport efficiency before implantation into the wafer being measured by use of the first and second Faraday cups.

15. (Once Amended) The ion implantation apparatus claimed in claim 11, wherein starting of implantation process is inhibited if a measured beam transport efficiency is less than a predetermined allowable lower limit.

16. (Once Amended) The ion implantation apparatus as claimed in claim 10, further comprising:

means for tuning the ion source and a beam transport system.

a1 cont'd

17. (Once Amended) An ion implantation apparatus as claimed in claim 10, further comprising:

means for comparing the measured beam transport efficiency with the predetermined allowable lower limit;

means for stopping the processing of the implantation in the case where the measured beam transport efficiency is less than the predetermined allowable lower limit;

means for displaying an error message in the case where the implantation is stopped and;

means for automatically starting the implantation process again by tuning the ion source and a beam transport system formed between the ion source and the processing chamber.

18. (Once Amended) The ion implantation apparatus as claimed in claim 10, wherein the mass analysis slit is variable in width which can be used to precisely adjust a beam orbit when tuning a beam transport system formed between the ion source and the processing chamber.

19. (Once Amended) The ion implantation apparatus as claimed in claim 12, wherein the mass analysis slit is used also as a deceleration electrode.

20. (Once Amended) The ion implantation apparatus as claimed in claim 10, wherein the mass analysis slit is automatically adjusted to a minimum width to adjust a beam axis by changing electric current of a mass analyzing magnet coil included in the mass analysis unit.

A' cont'd

21. (Once Amended) The ion implantation apparatus as claimed in claim 12, wherein the beam transport efficiency is measured by a Faraday flag provided just after a deceleration electrode section and a Faraday disk provided just after a wafer.

Sub B4

22. (Once Amended) The ion implantation apparatus as claimed in claim 10, wherein a beam transport efficiency is measured before the beam starts to impinge a wafer.

23. (Once Amended) The ion implantation apparatus as claimed in claim 15, wherein a specified ratio of energy contamination is set in each implantation recipe, which is automatically converted to the limit of the beam transport efficiency.

24. (Once Amended) The ion implantation apparatus, comprising:

a table for storing measured results in necessary beam electric current values on the basis of an inverse proportion relation between a beam transport efficiency in each ion species and an amount of an energy contamination; and

means for adjusting the energy contamination of ion implantation in the each necessary beam electric current value, by using a limit beam transport efficiency value obtained on the basis of the table.

A marked-up copy of the amended specification and claims is attached pursuant to 37 C.F.R. § 1.121.